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EYESIGHT IN CHILDREN.—NORMAL SIGHT.

BY G. B. BATTEN, M.D.

(Continued from page 256.)

IN a normal or good-sighted person the eye is adapted, when at rest, to receive parallel rays of light and to focus them without effort accurately on the retina: in other words a normal-sighted person sees distant objects without any effort. Light rays coming from all distant objects are practically parallel, and all objects more than 20 feet distant from the eye can be looked upon as distant objects, and these are focussed on the retina accurately.

But what about near objects, say letters held a foot from the eyes? The light rays leaving them are not parallel but divergent, so <, and, if strength of lens remains the same, the image is formed further away. In a photographic camera we arrange for this by putting the sensitive plate further away from the lens, it makes the camera longer. But we cannot elongate our eyes! Well, then, how do we focus these divergent rays coming from near objects on the stationary retina? By our power of accommodation: that is, by making our crystalline lenses fatter or stronger, and so bending the divergent rays more, and so making them come to a point sooner, or on to the same point (the retina) as the parallel rays converged when the lens was at rest, or less fat or convex.

A child with a normal eye can see distant objects, however far off, and can by use of its accommodation, which is very active in children, see clearly objects held even within three or four inches of its nose. As we get older the crystalline lens gets less supple and our power of seeing objects very near to us gets less, until eventually our near point recedes beyond ten or twelve inches: that is to say, beyond the distance we can see small print at, and we are then getting presbyopic, or old sighted, and should take to spectacles to help us. This usually occurs between 40 and 50 years of age in a normal-sighted person.

Errors of eyesight, or errors of refraction as they are called, are chiefly two: short sight or myopia and over-long sight or hypermetropia. In a short-signted person parallel

rays are brought to a focus not on the retina but on a point in front of it; this is because in short-sighted persons the eyes are too long. Therefore a short-sighted person cannot see distant objects clearly and using the accommodation only makes the rays converge more and, therefore, more out of focus. But the long eye of a short-sighted person is well adapted to receive the divergent rays from near objects, which you will remember come to a focus further behind the lens while the lens remains at rest, and, therefore, a short-sighted person can see near objects quite well, even without using his accommodation.

How are we to make these short-sighted people see distant objects? Well, of course, simply by bending the parallel rays outwards, making them into divergent rays in fact. We do this by a concave or hollowed out lens, which consists practically of two prisms with their apices together. The rays are bent towards the thickest part of the prism, and this, being outwards, bends the rays outwards and they enter the eye as divergent rays, and so are brought to a focus accurately on the retina at the back of the long eye of a short-sighted person.

Short sight is no doubt hereditary and in civilized countries, and especially in towns, no doubt many children are born with a tendency to short sight. Dr. Cohn, of Breslau, examined the sight of 10,060 young children and found that 1004 of them, or about one per cent., were short-sighted. But he and others found that as he ascended from elementary to higher classes in the schools, the percentage of short-sighted children rapidly increased, and, also, the degree of short sight got worse, and this increase went on the older the children grew and the more severe their studies, until among the graduates who had passed through the severe course of the Tübingen University all, or 100 per cent., were more or less short-sighted. Myopia or short sight is, in fact, a progressive complaint, at any rate until adult life is attained: that is to say, it is progressive if untreated or its progress not arrested. In fact, we now regard a short-sighted eye as one which has adapted itself for the work it has to do. Take a young child with a tendency to short sight, let it or make it do a lot of reading, writing, and other close or near work, and especially if we cause this to be done in a badly lighted room, we shall find the child holds the work near its eyes to see better, but to see well near its eye a normal eye has to use its accommodation or focussing power, *i.e.*, use certain little muscles as I have explained. These have a mechanical effect on the growth of an eye with a tendency to short sight, and the eye grows long, or in other words, gets short-sighted or adapts itself for looking at near objects without using its accommodation. Once having grown long it cannot even see objects beyond a certain distance away, and, therefore, a person with such eyes only looks at near objects, and his or her eye goes on adapting itself for only looking at near objects and the eye gets more and more short sighted. If this goes on too fast it may cause the coats of the eye to bulge so much that they almost give way and we get acute progressive myopia, and eventually almost absolute blindness.

How are we to prevent this short sight, or how are we to treat it when it has begun? Well, we must take care that all children, but especially children who have an hereditary tendency to short sight, shall be encouraged to look at distant objects, and this can better be done out of doors than indoors; that they have good print in their lesson books and a good light while at lessons, and I believe, for young children, the kindergarten system is especially useful, as that system of education does not make them read, or do too close work too young. Then if children are noticed to hold their work, or toys, or anything too close or sideways, they should have their eyesight tested by a competent medical man, and, if required, spectacles should be worn constantly. Speaking generally, the weakest concave glasses which correct the degree of short sight should be worn, for in short sight it does harm to wear too strong a glass.

It is erroneously believed that short-sighted eyes are good or strong-sighted eyes. This is because they can, without effort, see the details say of fine work easily—but this is all they can do, their range of vision is very small. Also, it is believed that short sight improves with advancing age. Well, it does not. What does happen is that the near point does not recede beyond the point where small print can be read so soon as in a normal-sighted person, but they cannot see further off or see distant objects any better as they get

older, certainly not. But a slightly short-sighted person would not have to take to glasses for reading so soon with advancing years as a normal-sighted person. Short-sighted people have usually smaller pupils than others. Short sight uncorrected tends in some cases to cause outward squinting, as I will explain later.

Hypermetropia or long sight, or, as it should be called, too long sight, is also very common. It is due to the eye being too short and long-sighted people are sometimes called flat-eyed. In them the retina at the back of the eye is too close to the front, and the rays of light converge behind the eye: that is to say, the images are not in focus. The flat eye of a hypermetrope is, when at rest, only adapted to focus accurately convergent rays of light, and as these don't exist naturally in nature, there is nothing that they can see accurately without effort.

By using their power of accommodation, however—that is, by making their crystalline lenses fatter and stronger—they can bring ordinary rays to a focus on their retinae, and so they can by effort see anything. But this effort is a much greater one than in an emmetropic, or natural-sighted eye. As I have explained, this effort of accommodation is done by little muscles in the eye which, if the effort is sustained, get tired and won't work until they are rested, and if the degree of too long sight is great they very easily get tired, and then the eye cannot ever see clearly and the power of the sight gets weaker, the sensitiveness of the retinae, the acuity of vision, gets less, until it may get so weak as to render people with extreme long sight practically blind. Especially is this the case when only one eye is too long-sighted and the other normal, or nearly so; the worst eye gives up trying to see and so gradually loses the power of sight.

Sometimes it is noticed that too long-sighted children, after reading for a time, hold their books nearer, like short sighted people do. This is because the eye is getting tired and holding the book nearer increases the size of retinal images, which, therefore, temporarily stimulates the retina more, despite the fact that images are less in focus.

How are we to correct hypermetropia, or too long sight? Well, first it is to be remembered that it may occur in very young children, and that it may and does cause a tendency to internal squint, which, if left uncorrected, usually leads to great impairment of vision in one eye. How are we to prevent it? Well, parents should, as soon as their children are old enough to pay attention, see whether their children can see very small objects very near their eyes without squinting or without fatigue, and then if they cannot let *their* eyes also be examined by a competent medical man, who can, by methods not depending on the child's answers, examine eyesight and order, if necessary, the proper *convex* lenses which should be worn always, and in some cases two pairs should be obtained, stronger ones for reading and near work, and others less strong for distant work. These glasses distinctly rest the eyes and relieve the condition.

A convex glass corrects too long sight simply because it makes the parallel or divergent rays from objects looked at into convergent rays, which are, as I have said, the only rays that the flat, too long-sighted eye is adapted to focus without effort. By doing this it relieves the little muscles of accommodation and lessens their work, and they don't get tired and the eye sees all right and sight does not suffer. Children with too long sight should wear proper convex glasses as soon as they can be got to do so, about five years old generally. Too long-sighted eyes are weak eyes for many reasons, and they get old-sighted sooner and must have the strength of their glasses increased at an earlier age than normal-sighted people.

There is another kind of sight which is entirely harmful. It is called astigmatism, or sight in which a round spot cannot be seen as such. This consists in the refractive power of an eye being different in different meridians or diameters. For instance, in an ordinary form of astigmatism vertical and horizontal lines cannot be focussed accurately on the retina at the same moment. Astigmatism is due to the shape of the cornea not being quite spherical like a ball or end of an egg, but unequally curved like the side of an egg, or like the back of a spoon, less curved in the length than from side to side. This defect causes distortion of images, and things are not seen clearly defined. This astigmatism is permanent and cannot be cured, but it can be corrected by cylindrical glasses, *i.e.*, glasses curved one way only to make up for unequal curvature of the cornea. Astigmatism may co-exist with long sight or short sight, and, in fact, we may

get any combination, and these do not unfrequently co-exist in children and should be carefully and accurately corrected by suitable spectacles, or the sight will get weaker and weaker. Astigmatism, or inequality of sight in different meridians of one eye, is a frequent cause of headaches, and headaches are caused, too, by difference of sight in the two eyes, and these headaches can only be cured by suitable glasses.

Squinting in children is often regarded as hereditary, but probably it is the long or short or bad sight which causes the squinting, which is hereditary. Short sight tends to cause outward squinting, too long sight tends to cause and is a very frequent source of internal squinting in children. To explain this I must remind you that there are three actions or movements which all go together, and which are intimately associated through the nervous system with each other, namely, convergence, accommodation, and the stop action of the irides on the size of the pupil. When a normal eye is looking at a distant object in a natural light all these are inactive. But directly one looks at a near object three things happen. First, we converge the direction of sight and, therefore the axes of our eyes on that object, *i.e.*, we look inwards with both eyes; secondly, we accommodate or strengthen the lenses of our eyes so as to focus accurately the divergent rays from the near object on our retinae, and, thirdly, the pupil gets smaller (the light remaining the same) so as to shut off the outside rays from entering the edges of our lenses, just as a photographer photographs a near object through a smaller opening than he does a distant object. These three actions all go together in amount also, that is to say, if we converge much we also accommodate more and our pupils get smaller.

In a natural-sighted person this is all right. But take a too long-sighted person. He, as I have said, has to use a special effort and to accommodate much more to see a near object; he, therefore, tends to converge his eyes more, in fact, too much, and then the two eyes see two images instead of one. This bothers the brain and, after a time, he gives up looking with two eyes and only looks at the object with one eye, and then the other eye goes in towards the nose and an internal squint is produced. If it is always the same eye that squints it is called a fixed squint, and the power of sight in that eye is soon nearly lost from disuse. For a similar reason a short-sighted person may develop an external squint, one eye only looking at the object and the other wandering outwards.

Squints can usually be prevented by the early correction of errors of the eyesight by suitable spectacles, or even after they have started by the addition of prisms to their glasses. When they have become fixed, however, an operation only can cure the squint, and this should certainly be done before the sight in that eye has got too weak, *i.e.*, before it is too late to save the eyesight of that eye. The proper glasses should be worn after the operation or it will, of course, tend to be caused again. It is a great, a fatal mistake to put down squinting to a bad habit. A healthy normal eye does not get into the habit of squinting, however much it sees other people who squint.

Now as to the general hygiene of the eye. In newly born infants the doctor or the nurse should prevent purulent opthalmia, which is the cause of about thirty per cent. of all blindness, by carefully cleaning out the eyes after birth with harmless antiseptics, and, of course, washing the eyes separately and with different towels from the rest of the body. These inflamed mattery eyes of newly born babes are not due to cold but to contagion, and it is much easier to prevent than to cure, although nearly always it can be cured and the sight saved if treated properly and in time, *i.e.*, at once. A baby's eyes are very sensitive and should not be exposed to bright light. A warm, bright, fresh, well-ventilated, but not too draughty a nursery, is as essential for the eyesight as for the rest of the body. A child's eyes should, however, never be wrapped up or covered over with anything warm or heating. And I may say here, although I am not dealing now with diseases of the eye, that poulticing an eye is nearly always very bad treatment, and a patient or nurse should never, never, never poultice an eye, or put anything over an eye which can act as a poultice, unless specifically told to do so by a medical man. I have seen many eye diseases made worse by poulticing and some eyes even rendered blind.

Lastly, as to illumination, light is always best coming from behind and to the left and fairly bright on the book, with the eyes themselves in comparative shade.

THE
TRUE BASIS OF A RATIONAL EDUCATION.

By the Rev. H. H. Moore, M.A.,
Vicar of St. John's, Darwen.

(*Continued from page* 239.)

Religious and Moral Education.—Assisted by these *precognita* in the construction of our scheme of education, and guided and limited by these conditions, we are necessarily led to recognise as the first and most supremely important part of education, *the religious instruction and training.* This is of first importance *in itself*, *and as compared with all other subjects of study*, *and spheres of knowledge.* As the Deity is the Supreme Being, the primal force, the foundation fact, in the universe, so the knowledge of the Deity's nature and character (using the term reverently) as it is revealed by His words and works and dealings with us, must be the highest knowledge of all to which man can attain. But this knowledge is of supreme importance also (2) as regards man's own destiny, conduct, and interests. On his right apprehension and fulfilment of his relationships to that Supreme Being depend vitally and inseparably man's own happiness here and for eternity.

My first step then in constructing a scheme of education for any and every class of society, is to assign the first and highest place of importance and attention to the religious instruction and training of children, because they are the basis and chief factors of *character* and *conduct*; and on character and conduct each individual's temporal and eternal happiness depends, and on the character and conduct of its people the State has most of all to depend for the elements and conditions of its security, strength, and welfare.

The Culture of Bodily Health.—The subject which I place second in importance in the category of chief wants, both for the individual and for the State, is *Health.* The education